Chemistry 640 Advanced Organic Chemistry Fall 2019
Tuesdays and Thursdays 5:30-6:45 CHM 193 9/3-12/12
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Syllabus

This course will cover a wide range of topics in Organic Chemistry. The theme of the course is the association of structure with function, and development of the ability to predict reactivity. As the real course goal is to present principles rather than to describe specific reactions, there is some flexibility as to the specific reactions and topics we discuss. I am happy to receive suggestions, and can likely incorporate any reaction you are interested in as an example of some topic we cover.

Text: We will be using Advanced Organic Chemistry Part A: Structure and Mechanisms 5th Edition Authors: Francis A. Carey, Richard J. Sundberg
ISBN: 978-0-387-44897-8 (Print) 978-0-387-44899-2 (Online)

You will also find your previous Organic Chemistry texts useful, particularly at the start of the course. Not everything covered in the course will be covered in the text. You are responsible for whatever is covered in class. While the text will be very useful, and readings will be assigned, we will not be following the sequence of the text, nor will we cover topics in the same emphasis. We will not cover everything in the text, which should come as a relief, since the text is enormous.

Tentative sequence of topics: (The detail of coverage will vary.)
Structure and reactivity: stability/reactivity, pKa estimation, arrow pushing.
Conformational analysis: Cyclohexane, A values, decalin, macrocycles, acyclic conformational determinants, molecular mechanics.
Stereochemistry and NMR.
Reaction mechanism: Classification, arrow pushing, qualitative predictions.
Nucleophilic substitutions, polar additions, and eliminations.
Electrophilic reactions: aromatic substitution, carbene and nitrene reactions.
Quantitative predictions (Linear Free Energy Relationships).
Rearrangements of various types.
Carbonyls: electrophilic reactivity and preferred direction of attack, nucleophilic reactivity, synthesis.
Aromaticity, MO theory, pericyclic reactions, Woodward-Hoffman rules.
Free-Radical reactions.
Enantioselective reactions and synthesis.

Depending on class interest, we can go deeper into some topics, or add some. The basic idea of the course is to make sure you have the tools needed to critically evaluate any reaction pathway, so we can use almost anything as an example.

Grading:

Problem sets: (50% of course grade)
Problem sets will be assigned most Tuesdays, and are due by the start of class on the following Tuesday. These problem sets are absolutely critical to learning the material.

Exams: (50% of course grade)
There will be exams on approximately October 17 and December 17 at the regular course time and place. The second exam constitutes our final exam, but the first exam is weighted equally. If you express opinions on how and when these exams are given, I can take those into account.

The way to learn the material, and to tell whether you have learned it, is to work problems. Many problem sets will be provided, most of them written specifically to cover material presented in class. The text is useful as a reference for these, but will not necessarily lead you to specific answers in a direct way. Some of the problems will be assigned from the text, and for these you may be confident that the skills needed to solve them are included in the chapter associated with those problems.

Homework problems should be attempted on your own. While it is acceptable to work together on the homework, keep in mind that your goal is to master the material, so you can demonstrate that mastery on exams and throughout your career. Don't let someone else's work cheat you of the benefits of working the problems yourself. Working together can be good motivation, but be careful of providing answers to questions to one another. These are less helpful in the long run than discussion because it is the process of coming to an answer that you want to practice.

If any part of an exam is allowed outside of class, note that on exams you are *not* allowed to work with others, ask questions of anyone but me, or to consult the internet. Doing any of these things is a serious breach of ethics. Scientists generate new knowledge. Dishonesty brings into question everything you have ever done, completely invalidating all your scientific accomplishment.